



Generator Data Validation

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- Why?
- How?
- When?

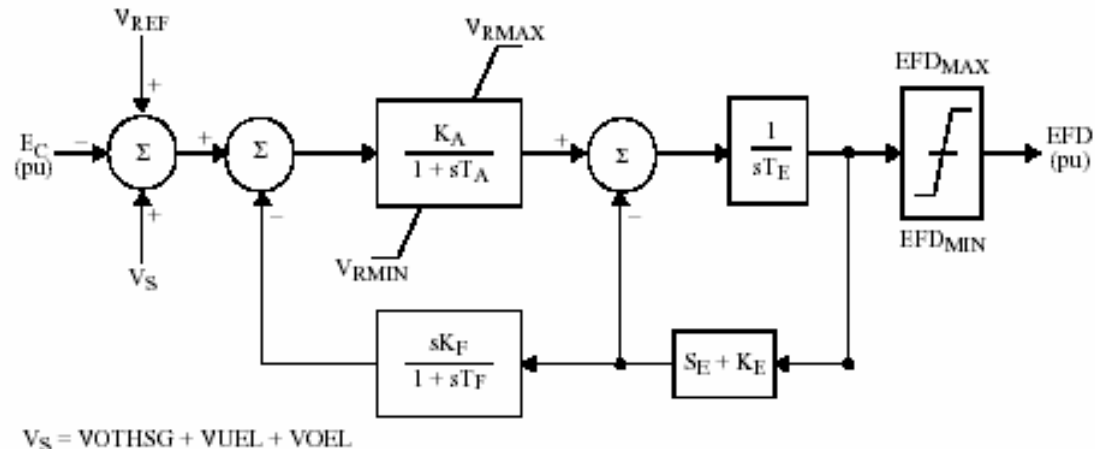


Why? - Blackout Recommendation

- Blackout Recommendation 24 states: “Improve quality of system modeling data and data exchange practices.”
- In particular: “– within one year the regional councils are to establish and begin implementing criteria and procedures for validating data used in power flow models and dynamic simulations by benchmarking model data with actual system performance. Validated modeling data shall be exchanged on an inter-regional basis ---”

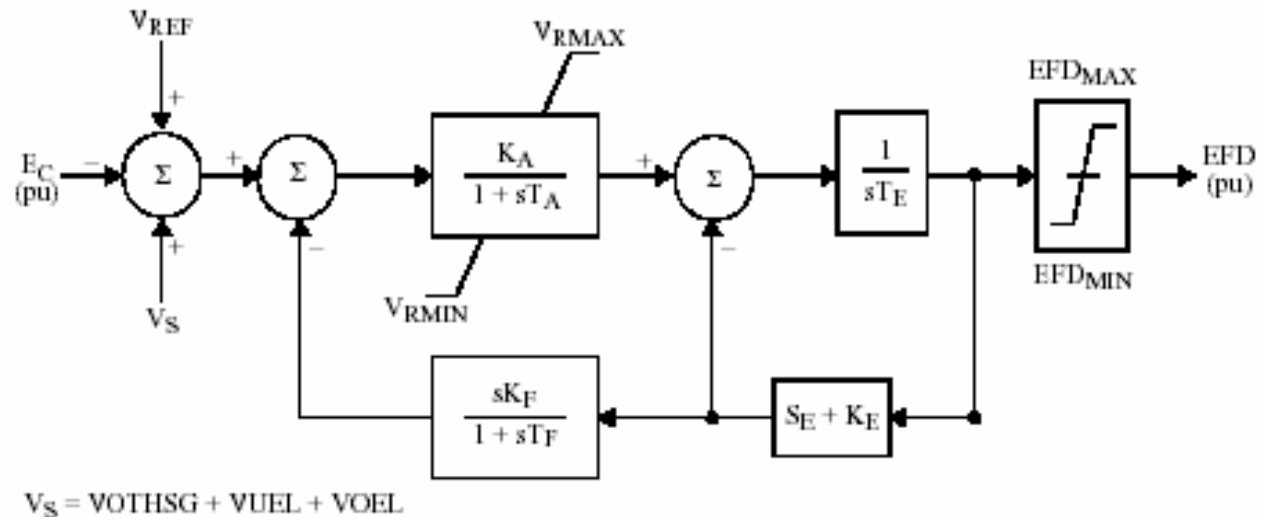
Why? - Current State of Generator Data

- TVA has excellent planning, operational, and data management tools, but the data itself is incomplete and outdated.
- Some nameplate data is based on typical values because actual values are not available.
- New equipment has been installed and settings have been altered by generators, but models have not been changed.

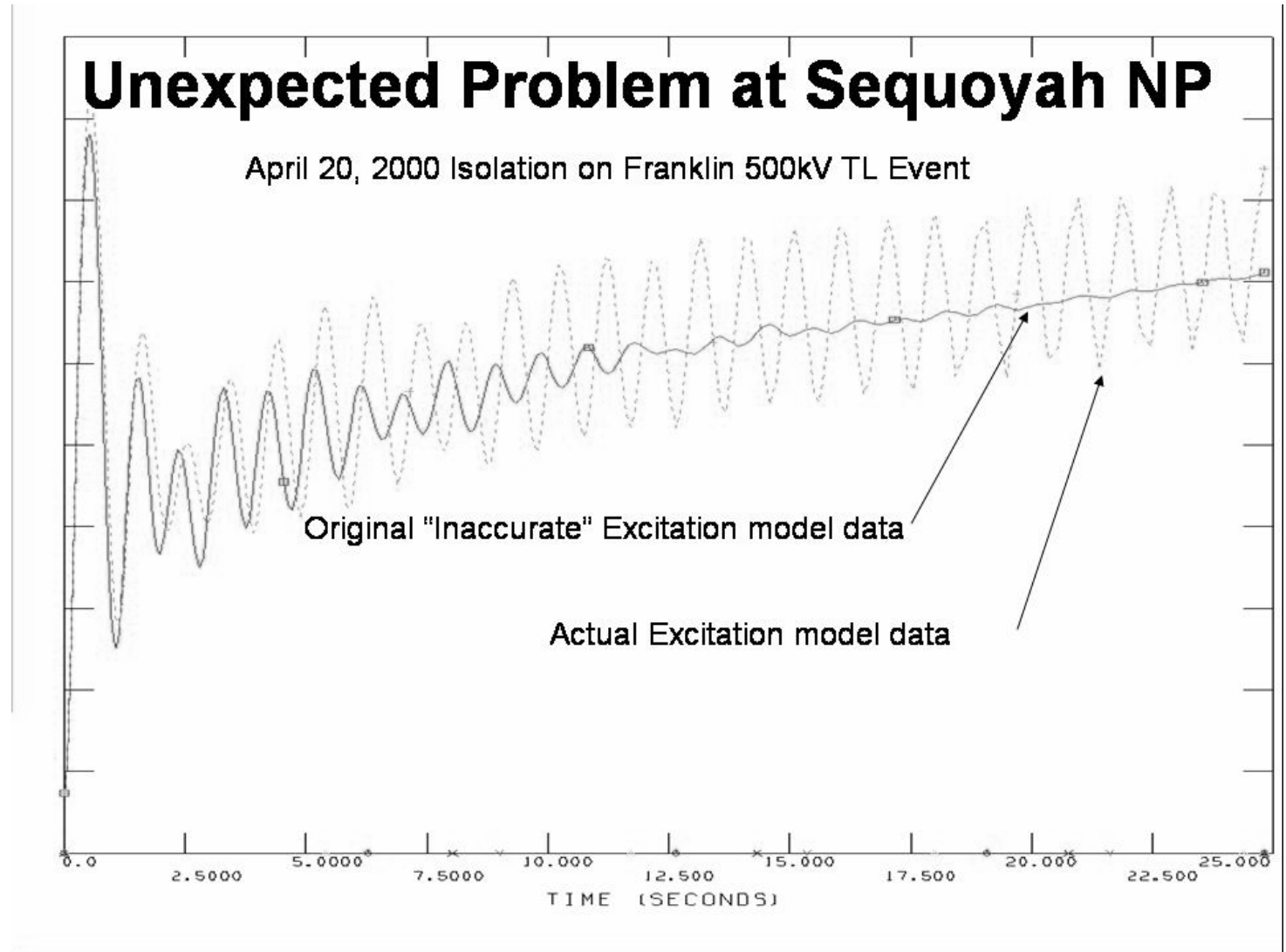


Why? - There is a need to improve Generator Data

- August 14th blackout has caused increased awareness in Generator protection.
- Failure to predict stability problems. Problems have occurred.
- Inability to operate system efficiently due to constraints on generation or transmission.
- Under- or over-investment in system improvements.



Why? – Problem of Actual Vs Assumed Exciter Settings





How? – What data?

- All generator system data including:
 - Machine constants
 - Transformer impedances and taps
 - MW and MVAR capabilities – Reactive capability curves
 - Exciter models and settings
 - Power System Stabilizer models and settings
 - Station service load



How? – Data Requirements

TVA Interconnection Request Data Sheet

Requester: _____

Site: _____

Generator Make and Model (Separate sheet required for each type of Generator): _____

Number of generators of this Make and Model at this site: _____

Generator Nameplate Ratings (per generator):
MVA: _____ MW: _____ Power Factor: _____ Terminal Voltage: _____ kV Machine Speed: _____ rpm
Expected Summer MW output: _____ Expected Winter MW output: _____

Machine Reactances in Per Unit on rated MVA base:
 X_d _____ $X'_d(\text{unsat.})$ _____ $X'_d(\text{sat.})$ _____ $X''_d(\text{unsat.})$ _____ $X''_d(\text{sat.})$ _____
 X_q _____ $X'_q(\text{unsat.})$ _____ $X'_q(\text{sat.})$ _____ $X''_q(\text{unsat.})$ _____ $X''_q(\text{sat.})$ _____

Armature Winding Resistance (per-unit):
 R_1 _____ R_2 _____ R_0 _____

Generator Neutral Impedance Data: _____ Sketch Attached? ☐

Machine Time Constants (Seconds):
 T_{do} _____ T'_{do} _____ T_{e0} _____ T'_{e0} _____

Total Spinning Inertia (H constant): _____ MW Sec/MVA

Very Important - Include Generator rotor, turbine, and exciter if spinning and coupling

Generator Step-Up Transformers: _____ - _____ kV (single-phase ☐; three-phase ☐)

%R	%X	MVA Base	Non-spike Ratings	MVA
H/L			H	
H/T			L	
L/T			T	

Winding Connection (wye/delta) H _____ L _____ T _____ Sketch Attached? ☐
Neutral Impedance Data: _____ Sketch Attached? ☐

Power Transformers - Attach same data as the Generator Step-Up Transformers above: Attached? ☐

•TVA requires a delta winding (maybe embedded) in all power transformers
•Upon installation, transformer test reports must be provided to TVA

Attachments

Sketch of Proposed Interconnection Configuration: _____ Provided? ☐
Generator Reactive Capability Curves: Dwg/ID No. _____ Provided? ☐
Generator Saturation Curves: Dwg/ID No. _____ Provided? ☐
Construction and Emergency Backup Power Amounts and Arrangements Provided? ☐

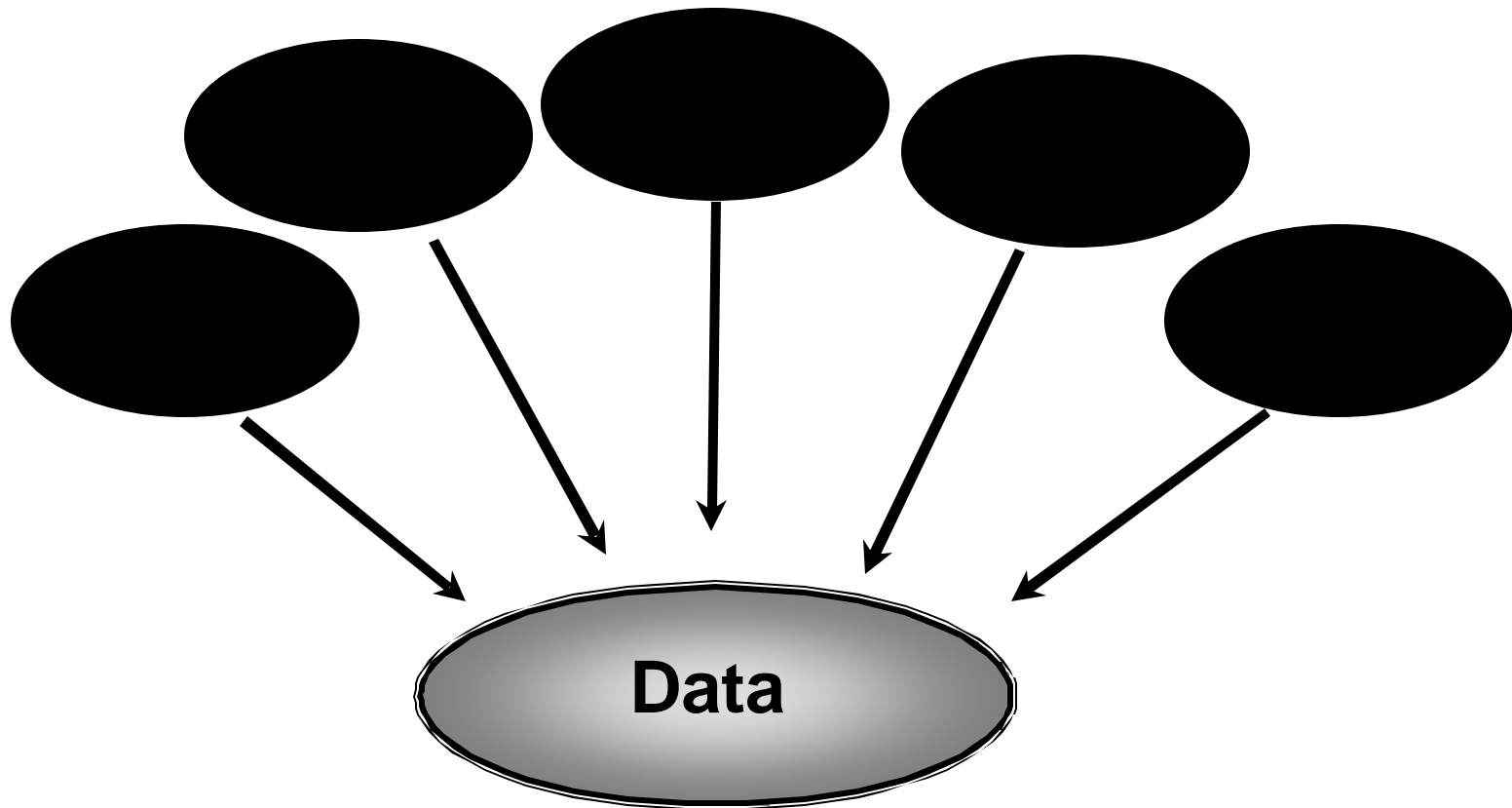
IEEE/Powers Technologies, Inc.® (PTI) Power System Simulator Software Model (Required):
TRF00PTI Model Name PTI Model Data Sheets Provided: _____ Generator Data Sheets Provided: _____

Generator Model: GENROU ☐ ☐
Exciter Model: _____ ☐ ☐
Governor Model: _____ ☐ ☐
St/HVtr Model: _____ ☐ ☐

•Upon installation the models must be updated with actual data and the test results provided to TVA

How? - Generator Data Working Group

- Purpose: Provide avenue for generators to coordinate the collection of all needed data in an efficient process.





How? - GDWG Goals

- Data is up-to-date and accurate.
- Data changes are captured in a tracking process.
- Data is verified, tested, and included in system models.

Improved data and analysis results in more efficient and reliable operation of the system.



When? - Current State of GDWG

Pilot Project launched to verify data for:

One fossil plant- Kingston (4 units)

One hydro plant- Raccoon Mountain (PS)

- Using SERC II.B Standard Data Sheet which complies with NERC and SERC planning guidelines.
- 109 Hydro and 130 Fossil units remaining to be tested.



When? – GDWGG – Next Steps

- Consultant will be hired this fall to oversee testing and data gathering and to assure compliance with NERC/ SERC requirements.
- Testing of pilot units will be next spring.
- Implementation of procedure for exchange of data by next spring.
- Testing of all units within 5 years.